TELEVISION

First Principles of Television

Variation in Visual Effect Gained by Scanning Object Vertically or Horizontally.

By A. DINSDALE.

PART XIII.

It only remains now to point out that, as an aperture of infinitely small dimensions is the unattainable ideal for television, the best results, from the point of view of clear definition, will be obtained by the use of as small an aperture as possible. But if the aperture is made too small, quite apart from the mechanical difficulties of drilling very small apertures accurately, a point will be reached when the loss of light, both at the transmitting and receiving ends, will become a serious factor. This is one of the limitations of the present Nipkow disk system, and until a different system is devised we must be content with a compromise. Even then any system which builds up an image from either strips or dots will suffer from the defect to an extent which will be dependent upon the degree of fineness of analysis and synthesis of the image.

However, it must not be thought that the Nipkow disk system is capable of producing acceptable results; on the contrary, modern electrical and mechanical engineering ingenuity is capable of producing disk and associated equipment which will give admirable results, although the field of view which can be reproduced with such good results is restricted to the human head and shoulders.

Another factor of image structure which remains to be considered is the picture ratio, which is simply the ratio between the height of the picture and its width. In the case of the Baird system this ratio is 7 to 3, which means that the circumferential distance between one hole of the scanning disk and the next is seven linear units, while the radial distance between the outermost and the innermost holes of the spiral measures three linear units; in othr words, the image is three units wide by seven units high. The standard picture ratio laid down for use in Germany is three to four, while most American experimenters use a one to one ratio; that is to say, they produce a square picture. Figures 25 and 26 will serve to illustrate what is meant.

Besides using a picture ratio entirely different to any one else, Baird is also practically the only worker who scans his images vertically, the others scan horizontally. In the case of vertical scanning by means of a disk, the received image appears at the side of the disk and the "grain" or strip lines of the image structure show vertically. When horizontal scanning is employed by means of a disk the received image is seen at the top of the disk and the lines run horizontally. Figures 25 and 26 illustrate both methods.

These differences of standards are naturally confusing to any one approaching the subject for the first time. Undoubtedly a universal standard will ultimately be adopted; otherwise international television broadcasts will be impossible unless one has an interchangeable receiver—a cumbersome and unsatisfactory arrangment somewhat comparable with the present state of broadcasting in Europe, where one has, with many receivers, to change coils in order to change from medium to long waves, and vice versa.

Haphazard Standards.

The choices made by different workers have, up to the present, been largely haphazard, and for the benefit of students of the subject, the considerations leading to the choice of these various standards will be briefly outlined. The first man to use horizontal scanning appears to have been Jenkins, who used it in his first shadowgraph demonstration in 1925, and so far as the author has been able to ascertain by personal inquiries the choice seems to have been purely haphazard, probably due to some feature of the construction of the apparatus which made it more convenient to use the top of the disk. The fashion having been started, others followed suit.

The Germans, surveying the chaos which existed at the time when they commenced to take an official interest in the subject, made the choice of their standards as the result of intelligent and typically methodical reasoning. The picture ratio which they finally adopted, three to four, is the standard motion picture ratio, and was selected partly because it is the ratio of height to width to which everybody has become accustomed and expects in any picture, still or moving, as witness the popularity of the 3¼×4¼ inches (quarter plate) camera; and partly because the German plan is to broadcast cinematograph films in the first place, during the initial experimental broadcast transmissions.

Having thus settled the ratio, horizontal scanning follows almost as a matter of course, for in order to obtain the greatest detail the picture strips must run the long way of the picture; to scan vertically would entail the employment of larger holes in the scanning disk, with consequent loss of detail. The alternative would be to keep the diameter of the holes the same, but increase their number, with consequent increase in the frequency band to be transmitted.

For the transmission of television only (and not cinematograph films) the limitations imposed at present by the available frequency band width make it impossible to transmit on the broadcast wave band, with a reasonable amount of detail, any scene much more extensive in area and detail than a head and shoulders view of a human being. Now, if the human face be considered for a moment it will be realized that the most prominent characteristic lines which go to make up the features (hair over forehead, eyebrows, eyes, nostrils, mouth, chin line) run in a horizontal direction, and it is demonstrable fact that strongly marked lines can best be scanned and reproduced in a direction at right angles to them. This is because of the distortion created by the aperture effect. Under these circumstances vertical scanning, as adopted by Baird, is obviously best suited to present conditions.

As to the picture ratio under these circumstances, a few moments study of a head and shoulders photograph of square dimensions will reveal that quite a lot of paper can be cut off both sides without in any way detracting from the likeness and pictorial value of the photograph. See Figure 76. A ratio of height to width of three to one, or even four to one, will still preserve all the relevant details. Baird has finally settled down to using a ratio of 2.3 to 1 (7 to 3) for the above reasons, and for reasons of economy of frequencies and simplicity of apparatus, but a narrow oblong picture such as is given by a seven to three ratio does not permit of very much lateral movement on the part of the subject being televised—a disadvantage which handicaps an artist who is trying, by visual means, to augment his vocal effort to broadcast an item which will entertain the recipient.

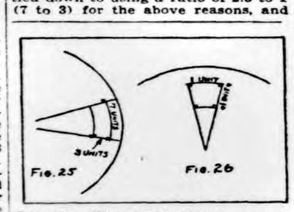

Fig. 25—The Baird picture ratio is 7.3. This gives a narrow oblong picture, as shown above. The graph represents vertical scanning. Fig. 26. The accepted American ratio of 1.1 forming a picture very nearly square. Horizontal scanning is offered here.

There is another highly interesting point which has a bearing on the horizontal v. vertical scanning controversy.

If the electric motor which drives the television receiver has the slightest tendency at all to hunt, the movement imparted to the image, in the case of horizontal scanning, is to and fro horizontally; in the case of vertical scanning the movement is vertical. Now, it is a curious fact that, through long usage, we can more readily detect horizontal movement. Most movements in our everyday life take place in a horizontal plane, and so we have become accustomed to detecting them and moving our eyes from side to side rapidly. We are not accustomed to such rapid and continual movement in a vertical plane, *in spite of the increasing numbers of* airplanes which tend to attract our attention to the skies. On the contrary, we subconsciously oppose small vertical movements because, when we walk, our heads move slightly up and down; our eyes have become so accommodated that we do not notice the resultant slight vertical movement.

(To be continued.)

R. F. PENTODE COMING

Tube Giving 20% Higher Amplification Is Ready.

The radio frequency pentode tube, introduced for the first time more than a year ago, but not generally accepted by the radio industry, is to make its appearance again.

Announcement was made this past week at Providence, R. I., by the Ceco laboratories, designer of the original tube, that several improvements had been made in the device. The tube resembles the screen grid in appearance, but contains an additional screen, *giving from 10 to 20* per cent. more amplification than is possible with RF amplifier tubes now available. Connection of the extra screen is similar to that in the power pentode, introduced this year.

The tube is designed primarily for direct current or storage battery use, requiring a filament voltage of 2.5 at current drain of 0.3 A. peres. The plate voltage ranges from 135 to 180 and the screen at 90, with the minimum grid voltage thirs volts negative.

Brilliancy Control Should Be By-passed at Neon End

Do not reduce the voltage on the neon lamp of your television receiver by putting resistance in series with it unless the end of this resistance nearest the neon tube ns bypassed to ground with a large condenser.

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W2XAB SOURCE OF FEATURES

Columbia Station Is Offering Finest Attractions.

With the available talent reduced at W2XCR because of the curtailing of WGBS's time on the air, the local ether is less fertile these days with suitable television images. For evening consumption the 2,000—or is it 20,000—lookers-in must rely upon Dr. Bill Schudt's array of features as they are paraded before the shifting spot of W2XAB's camera.

For the coming week the able doctor will present such sterling attractions as "charcoal caricatures," tap dancing, piano lessons and a special televistic lesson in hairdressing by an expert who happens to be no other than Antoine of Paris, and who is said to have been the father of the shingle bob.

In detail, here is the set-up for this station:

Fred Smith and Lincoln Barnett, tap dancing artists, will demonstrate in slow motion the latest steps and will explain the various rhythmic interpretations while going through this routine from a three-foot high platform on Monday at 8:30 P. M. Paul Frehm will entertain with fifteen minutes of charcoal caricatures on the same night at 10 o'clock.

Piano Technic by Television.

G. Aldo Randegger, pianist, teacher and composer, will demonstrate the proper finger motion connected with piano technic on Monday at 9 P. M. Maestro Randegger will be assisted in this feature by one of his young pupils, Miss Lydia Ranieri.

Ezilda Sutton will present a series of "International Characterizations" on Wednesday at 9:45 P. M. She has appeared with Richard Mansfield in "Cyrano de Bergerac," and under the direction of Charles T. Salisbury in "Shenandoah," "Sweet Lavendar" and "Trilby." At other periods she was in the Criterion Players' productions of "The Rivals," "The Scrap of Paper," "Caste" and "She Stoops to Conquer."

Antoine of Paris, noted hairdresser who introduced the "shingle bob" in this country, will give a special television hairdressing demonstration for the feminine audience on Friday at 9:45 P. M.

Red Cagle, former football star at West Point and now a member of the New York Giants' professional team, will be interviewed for a second time by Charles Speer, the former champion swimmer, who has been conducting the series "Television Hints for Swimmers." Cagle will give his predictions on the important games played by major colleges in all sections of the country for the following Saturday. This appearance is scheduled for Friday, November 6, at 10:15 P. M.

Song recitals featuring the following artists will be broadcast during the week: Harriet Lee, "Miss Radio 1931"; Grace Yeager, soprano, formerly with the San Carlos Opera Company; Myndell Louis, Australian concert artist; Stephanie Wall, internationally known soprano, and others.

The usual exhibition boxing match will be seen on Tuesday, November 2, featuring two fast-stepping boys from the *A. A. U.*; also the Navy vs. Ohio State football game will be broadcast on the special designed television board from Ted Husing's description over WABC.

LENSES BUILD LARGE IMAGES

Their Length and Use Determine Size of Picture.

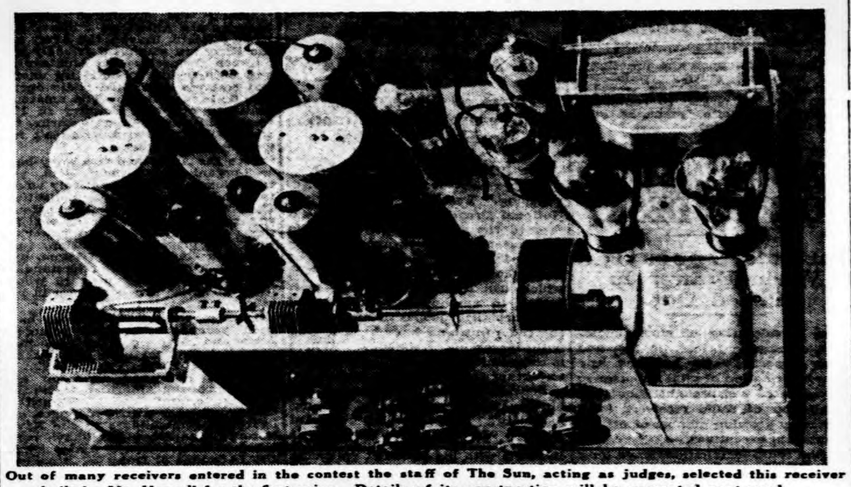
The apparent height of an image as received by a television receiver is equal to the off-set of the spiral on the disk times the magnification of lenses if used. That is why a greater magnification of the image can be obtained by the projected image system than by the direct vision system.

The image size in a direct vision system according to engineers of Radio Pictures, Inc., can be enlarged by increasing the distance "d" between the disk and lens, increasing the distance "D" between the lens and the observer or by using a lens of shorter focal length "f." However, "d" must always be less than "f." The magnification they say, is equal to (f times d plus f times D) divided by (f times d plus f times D minus d times D). Thus, if a lens of 8 inch focal length is placed 6 inches in front of the disk and the observer stands 36 inches in front of the lens, the magnification would be (8 times 6 plus 8 times 36) divided by (8 times 6 plus 8 times 36 minus 6 times 36) or 3.1. Now if the height or off-set of the disk spiral is ½ inch, the image will appear 3.1 times .5 or 1.55 inches high.

In this system, they continue, a practical limit to the magnification is reached because distortion increases as the image is enlarged. Thus, in the example above, if the lens is moved out to 7.5 inches from the disk and the observer moves back to 5.5 feet from the lens, the magnification is 6.3 and the image appears 3.15 inches high but somewhat distorted.

In the projected image system the magnification may be increased by increasing the distance "S" between the screen and the disk (the neon tube being moved with relation to the disk so as to focus the image on the screen) or by using scanning lenses of short focal length "f." The magnification is equal to "S" divided by "f" and may be made as high as 10 or even more without undue distortion of the image. By using highly corrected lenses, magnifications of more than 40 have been obtained.

Riverdale Experimenter Wins First Prize in Television Contest



Out of many receivers entered in the contest the staff of The Sun, acting as judges, selected this receiver built by Mr. Hansell for the first prize. Details of its construction will be presented next week.

Judges Decide His Ten-Tube Superheterodyne Excels Other Entrants in Performance and Skill in Design.

Erik Hansell of 5012 Waldo avenue, River-dale-on-the-Hudson, N. Y., has been awarded the grand prize for the best all-round television receiver submitted in the contest conducted by the radio department of The Sun durthe last ten weeks. His apparatus embodies a ten-tube superheterodyne in which he has included the features recommended by television engineers. After viewing all entries, the judges were unanimous in selecting Mr. Hansell's receiver, although many of the other instruments exhibited features which placed them in close competition with the winner.

In the ensuing weeks the television page of this publication will present details of the prize winners in order that other experimenters may duplicate these outstanding products of amateur builders.

Although it would have been possible in the majority of instances to study the entries from blueprints and sketches submitted, the staff believed that an honest selection could be made only by a personal visit to the home of each experimenter, where the apparatus could be demonstrated by the builder under the most favorable conditions. This program was carried out to the last detail, and the prize awards have been made on the basis of the results of these inspections carefully compared and valuated.

The requirements of each prize and the winner of each class are as follows:

First—For the best all-round receiver based on performance, appearance and ingenuity of design and construction—$100 and a Jenkins televisor kit. Erik Hansell, 5012 Waldo avenue, Riverdale-on-the-Hudson, N. Y.

Second—For second best all-round receiver with same requirements as above—$50 and Freed Eisemann short wave receiver kit. L. K. Degan, 220 Jackson avenue, Long Island City.

Third—For receiver showing greatest skill in selection of individual parts and utilization and arrangement of them, and including performance—$25 and Freed Eisemann televisor kit. Oscar Sussman, 74 Osborn street, Brooklyn, N. Y.

Fourth—For second best receiver assembled as in preceding paragraph—$15 and Jenkins short wave receiver kit. Harry Hersh, 961 Van Duzer street, Stapleton, Staten Island.

Fifth—For receiver using minimum number of tubes which will produce satisfactory images within twenty-five-mile radius of Forty-second street and Fifth avenue—$25 and Pilot K139 power pack. L. K. Degan, 220 Jackson avenue, Long Island City.

Sixth—For best plan or sketch of receiver and televisor housed in a single console with or without sound receiver—$25 and Insuline condensing lens, lens holder and scanning disk. L. A. Moguel, 146 West 105th street, New York, N. Y.

Seventh—For second best plan or sketch as above—$10 and neon lamp. Frank Harth, 4326 206th street, Bayside, L. I.

It is already evident that the contest has stirred experimenters into greater activity than they have experienced for several years. Some of this activity appeared too late to allow its results to be entered in the contest competition, but The Sun hopes for the privilege of presenting these later developments to its readers as rapidly as the home builders complete their work.

In the meantime the publication of plans of the prize winners will, it is believed, spur those who have yet to build a television receiver into definite action. Certainly some of the designs are well worth following if the home builder intends to study and enjoy the television broadcasts now being made available to residents of the metropolitan district.

VISION BANDS ARE LIMITED

In January, 1929, at Ottawa, Canada, an American conference was held setting aside the following frequencies for the use of television experiments: 2,000 to 2,100 kilocycles, 2,100 to 2,200 kilocycles, 2,750 to 2,850 kilocycles, 2,850 to 2,950 kilocycles, with an additional frequency channel of 2,200 to 2,300 kilocycles available for assignment in the South and Southwest regions of the United States, where such assignments would not interfere with the employment of the same frequencies which may be used for other purposes than television in Canada or in any other part of the American continent. At a glance it will be seen that there are only four frequency bands each 100 kilocycles wide for television work available for general allocation in the United States.

A policy of permitting and encouraging the type of legitimate experimental research work in television that will advance the art has been maintained by the Federal Radio Commission and it is for this reason that the present television frequency assignments are made on a purely experimental basis, subject to the provisions of General Order 64 covering experimental stations.

Should very high frequencies prove to be useful for the use of television a considerable advance in the art will have been made as the large band widths needed for television broadcasts can be more easily accommodated on these high frequencies.

Do not use a storage battery when connecting up one of the new two-volt battery receivers. A special battery has been made for the filament supply.

JAPAN ADDS TO STATION CHAIN

WASHINGTON, Oct. 31.—Plans for the construction of seven new broadcasting stations to widen the service being furnished by the fifteen existing stations of the Japan Central Broadcasting Corporation have been approved by the Japanese Department of Communications, according to a report to the Department of Commerce from the Assistant American Trade Commissioner at Tokio H. B. Titus.

A monopoly under Government auspices, with the Department of Communications having the power of censorship over programs, runs the radio system of Japan. Owners of radio sets, of whom there are nearly 800,000, pay a license fee of one yen (about fifty centsh) per month for the listening privilege. Advertising is barred.

Most of Japan's radio manufacturing industry consists of the assembly of sets from imported parts. Tubes also are largely imported, though there are several tube manufacturers, the largest an American subsidiary.

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XER OWNED IN MEXICO

Brinkley Adherents Deny Doctor Backs Station.

The new high powered broadcasting station with call letters of XER, whose signals on 735 k. c. have been interfering in some parts of the country with those of WSB at Atlanta, is not owned by Dr. John R. Brinkley, ex-medico broadcaster of Kansas, according to statements made in his behalf, but is a Mexican owned corporation. Despite this appeal in his favor, Dr. Brinkley has objected to the action of the new Mexican Government in ordering him from that country just as XER was about to go on a regular schedule.

Stories connecting the Kansas practitioner with the transmitter below the border have suggested that plans were being made for long distance lines linking his studio in Milford, Kan., with XER. It was his apparent intention to circumvent the orders of the Federal Radio Commission, which cancelled his license last year for KFKB, by continuing his tirades against the medical profession and his sales of home remedies by broadcasting from Mexico, outside the jurisdiction of the commission. The 75 k. w. station which he planned and which is now being heard in this country is more powerful than any here.

Tap-Dancing Course by Television and Sound

A tap dancing course is given Saturday afternoons at 4:15 under the direction of William McPherson over television station W2XCR and sound station WGBS.

The classic Army-Notre Dame football game, which is scheduled for the Yankee Stadium on November 28, has been added to the list of grid contests to be broadcast by WABC.

VERYLOWWAVE FOR VISION

All Signs Now Point to Use of Five Meter Channel.

WASHINGTON, Oct. 31.—Whether visual broadcasting or television is ultimately destined to go to the ultra-short waves will be known within the next year, in the opinion of well informed official and unofficial observers. Although it is too early to gauge the results already achieved on the extremely high frequencies, between 43,000 and 80,000 kilocycles (about 7 to 3.75 meters), some observers are already convinced that those will soon be the channels regularly assigned for the transmission of images by radio.

Their opinions are based on the fact that the present experimental television wave bands, all in the continental frequency group and each 100 kilocycles wide, are too few and now too crowded to permit of much further occupancy. Much remains to be learned about the ultra short waves, hitherto the "No Man's Land" of radio, but experiments so far have been highly promising.

Some Drop Out.

The latest to drop out of the television race voluntarily are American Television Laboratories, Ltd., of Los Angeles, with which Dr. Lee de Forest is identified, and Arthur Liebscher of Philadelphia, an independent applicant. On the other hand, there was a slight revival in television interest last week, when John Logie Baird, Scotch television scientist, arrived in this country, presumably to appear at the Radio Commission hearing on the application of WMCA, New York city, for visual channels on which it proposes to use Baird equipment.

Working on Low Waves.

Station KHJ, Los Angeles, owned by Don Lee, the first station west of the Mississippi to be licensed to have a television adjunct, is the latest to plan to go to the ultra-high frequencies on an experimental basis. Harry Lubcke, television director, is authority for the statement that the behavior of the new waves presents untold prospects. Because the waves emitted by a transmitter on these frequencies act somewhat like beams of light, they must be sent from tall structures, and must be free of obstructions such as buildings and hills.

Moreover, they do not travel, for the most part, beyond the horizon, thus indicating localized visual services. By the same token they have shorter ranges of interference, so that more stations can be added to them. It is this aspect of the ultra-high frequencies that gives most promise of an early introduction of television, and it is this aspect upon which the N. B. C., cooperating with the Camden laboratories of R. C. A., based its decision to build a 5,000-watt experimental station on the eighty-sixth floor of the world's talest structure in New York city.

Demonstrates Television In Department Store Window

A window demonstration of a television transmitter and receiver was given last week in Namm's store in Brooklyn by the Insuline Corporation of America. In one section of the window was a complete television transmitter in operation with its receivers located in another section of the window.

VISION NEARS 1ST YEAR GOAL

Progress Slower Than Expected Twelve Months Ago.

By C. E. BUTTERFIELD.

Since New York's Radio Show, television in the East has been more or less marking time.

The reason for this can be explained in several ways, one of which has to do with the fact that the several laboratories which had announced they would soon be ready with screen televisors have found that it has taken more time than at first thought to get ready for the market.

Another factor seems to be the decision of the radio industry as a whole that it should continue to concentrate on sound broadcast sets, at least for the present. What next year will bring no one can publicly foretell yet.

Experiments Go On.

Meanwhile experimental picture broadcasting is being carried along on about the same schedule as the last several months, with the transmitters on the Atlantic seaboard sticking to the policy of sending out images of 60 lines, 20 pictures per second.

Occasionally is heard some discussions about the possibility of shifting ultimately to the ultra short waves for the handling of television, but outside of several experiments not much progress along that line has been reported.

However, even if there is a decision to so shift, it is the plan of most experimenters to continue the transmission on the 100 and 150 meter channels for some time to come, running short and ultra short wave pictures simultaneously.

Just how fast television will take hold in public interest has been one thing that has caused considerable worry on the part of its enthusiastic backers.

Many of them feel that it will step along at a faster pace than did sound broadcasting, while others think that due to the problems that no doubt will spring up after its formal introduction it will feel its way more carefully.

First Television Year.

There seems to be a general feeling within the radio industry that too much attention should not be paid to experiments in television. This is based on the tenet that the laboratories need just a little more time to further their own work.

While this has been really the first television year and no doubt will be so looked upon by radio historians, the consensus appears to be that avid concentration on television manufacture will not come until the turn of the year, if then.

Ancient Art by Bellini Presented by Televisor

The showing of a world famous painting even before it has been publicly exhibited in this country is scheduled from 9:30 to 9:35 P. M. Monday, November 2, when the Columbia Broadcasting System's television facilities will project the recently discovered masterpiece "Portrait of a Young Man," by Giovanni Bellini. It is described by critics as the most notable discovery of Venetian art in the present century. The portrait is valued at $250,000. A description of the masterpiece and comments on it will be given during the television showing by Charles Henry Dorr, art critic.

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